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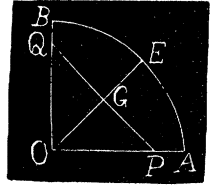
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wood, 1.026 the density of the sea-water. Then  $OG = \frac{4r\sqrt{2}}{3\pi}$ ,  $OP = OQ = \frac{8r}{3\pi}$ .

$\therefore$  area  $POQ = \frac{32r^2}{9\pi^2}$ , area quadrant  $= \frac{1}{4}\pi r^2$ , area

$$QBEAPQ = \frac{1}{4}\pi r^2 - \frac{32r^2}{9\pi^2}, \quad \therefore 1.026 \left\{ \frac{1}{4}\pi r^2 - \frac{32r^2}{9\pi^2} \right\} = \frac{1}{4}\pi r^2 \rho.$$

$$\therefore \rho = 1.026 \left( 1 - \frac{128}{9\pi^2} \right) = .5554.$$



This is the density of Juniper tree (dry) and very nearly the density of white pine (.554).

23. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics in Texarkana College, Texarkana, Arkansas.

Pliny says, "Thales determined the cosmical setting of the Pleiades to have happened in his time 25 days after the vernal equinox". Determine the time when Thales lived from the following data:—Latitude of Miletus  $37^\circ 30'$ , the precession of the equinox  $50''.34$  annually, the R. A. of Alcyon ( $\eta$  Tauris) Jan. 1, 1895, 3h. 41m. 15 sec. declination  $23^\circ 46' 49''$  N.

Solution by the PROPOSER.

Let  $\lambda$ =latitude of Miletus,  $a, \delta, t, a_1, \delta_1, t_1$ , the R. A. declination, and hour-angle of Alcyon and the Sun respectively;  $\epsilon$ =the obliquity of the ecliptic,  $\omega$ =the distance the Sun has traveled on the ecliptic after the vernal equinox.

Then  $\cos t = -\tan \lambda \tan \delta \dots (1)$ .  $\cos t_1 = -\tan \lambda \tan \delta_1 \dots (2)$ .  
 $\sin a_1 = \tan \delta_1 \cot \epsilon \dots (3)$ .  $a_1 + t_1 = a + t = \theta$ , or  $a_1 = \theta - t_1 \dots (4)$ .  $\sin a_1 = \sin(\theta - t_1) \dots (5)$ . From (3) and (5),  $\sin(\theta - t_1) = \tan \delta \cot \epsilon \dots (6)$ . From (2)

and (6),  $\tan \delta_1 = \frac{\sin(\theta - t_1)}{\cot \epsilon} = -\frac{\cos t_1}{\tan \lambda} \dots (7)$ . From (7)

$$\tan t_1 = \frac{\sin \theta \tan \lambda + \cot \epsilon}{\cos \theta \tan \lambda} \dots (8):$$

Also  $\cot \omega = \cos \epsilon \cot a_1 \dots (9)$ . Now  $\lambda = 37^\circ 30'$ ,  $\delta = 23^\circ 46' 49''$ ,  $a = 3$ h. 41m. 15 sec.,  $\epsilon = 23^\circ 27' 13''$ . From (1),  $t = 109^\circ 45' 43''.57 = 7$ h. 19m. 2.9 sec.  $a + t = \theta = 11$ h. 0m. 17.91 sec.  $= 165^\circ 4' 28''.57$ . From (8)  $t_1 = 106^\circ 30' 10''.94 = 7$ h. 6m. 0.73 sec. From (4),  $a_1 = 3$ h. 54m. 17.18 sec.  $= 58^\circ 34' 17''.7$ . From (9),  $\omega = 60^\circ 43' 28''.47$ .

In one day the Sun moves  $59' 8''.35$ .  $(59' 8''.35) \times 25 = 24^\circ 38' 28''.75$ .  $60^\circ 43' 28''.47 - 24^\circ 38' 28''.75 = 36^\circ 4' 59''.72 = 129899''.72$ .  $129899''.72 \div 50''.34 = 2580.44$  + years.  $2580.44 - 1894 = 686.44$  B. C., when Thales determined the cosmical setting of the Pleiades.  $60^\circ 43' 28''.47 \div 59' 8''.35 = 61.6085$  days after vernal equinox.  $61.6085 - 25 = 36.6085$ .  $59' 8''.35 \div 50''.34 = 70.48768$  years.  $79.48768 \times 36.6085 = 2580.448$  +.  $2580.438 - 1894 = 686.448$  B. C.

Also solved by F. P. MATZ.